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WEATHER PREDICTION BY MACHINE LEARNING

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Abstract

Weather Project application is a web-based application where you will be able to access all reports related to weather forecasts for any locations.

Its location detected by your browser setting and server configuration will automatically identify the location and be able to present its weather information such as temperature, wind direction, rainfall, humidity etc.

To change location you will have to select the options provided below to get its details. Its new avatar and feed burner will also allow its users to receive weather reports directly from their mail, where they have not been able to access this particular domain even if the server is down.

INTRODUCTION

Weather forecasting is the use of science and technology to predict the atmospheric conditions of a given area and time.

People have been trying to predict the weather informally for thousands of years and since the 19th century. Weather forecasts are made by collecting information about the current state of the atmosphere in a particular area and then using the weather to predict how the atmosphere will change. Individual input is still required to select the best predictive model to establish the prediction

When it comes to human activity that is largely based on changes in barometric stress, current climate, and weather or cloud cover, weather forecasting is now relying on computer-based models that look at a number of celestial objects. Individual input is still required to select the best predictive model to establish the prediction, which includes pattern recognition skills, telephone communication, model performance information, and model bias information.

The use of computers in the field of information management is well known to us .The use of computers in the university management system offers the following benefits in addition to the manual system.

1.) Availability

It gives us information that was not provided in the manual system.

2.) Time

Provides details (output) in a short time.

3.) Accuracy

With the help of a computer, we will get information more accurate than the information collected and handwritten.

4.) Perfection

The computer never provided us with incomplete information. We will always have complete and complete information on a computer.

5.) Purposeful and practical action Whatever work we give a computer to do, the computer only works for that specific task. It means that the computer always does a purposeful and user-friendly service.

Problem Formulation

Predictability inaccuracies are due to the prevailing weather conditions, the high calculation power required to solve atmospheric calculations, the error involved in estimating the initial conditions, and an incomplete understanding of atmospheric processes. Therefore, the predictions are less accurate as the difference between the current time and the time the forecast is made (the range of the forecast) increases. The use of ensembles and a harmonious model helps to minimize error and select the possible outcome.

There are various ways to end climate use. Weather warnings are important predictions because they are used to protect health and property. Temperatures based on temperatures and rainfall are important for agriculture, so for traders in the middle of the commodity markets.

Project Category

Advances in software technology continue to be strong. New tools and strategies are announced in quick succession. This has forced software engineers and industries to continue looking for new ways to build and develop software, and they are increasingly critical of the growing complexity of software programs and the growing competition in the industry.

This rapid development seems to have created a crisis for the industry. The following issues need to be addressed to address this issue:

• How can you represent real-life problems in project design?

• How can you create plans with an open space?

• How can you ensure the reuse and extension of modules?

• How can you build modules that are tolerant of any future changes?

• How can you improve software production and reduce software costs?

• How can you improve service quality?

• How can you manage time schedules?

• How can you simulate a software development process?

Many software products have not been completed, or have not been used, or some have been submitted with major errors. Reducing such errors with software technology gradually emerges. Since the introduction of the computer, many editing methods have been tried. This includes strategies such as the modular system and the formal system.

Procedure-Oriented Programming

Ordinary systems, using advanced languages such as COBOL, FORTRAN and C, are more commonly known as systematic process (POP).

Problems with POP

• In a systematic approach, the problem is considered to be a sequence of tasks, such as reading, counting and printing.

• In large systems it is very difficult to identify which data is used by which function.

• Another serious problem in the process is that it does not reflect the real world problems very well. This is because the tasks are directed to action and do not really correspond to the elements of the problem.

Object–Oriented Programming

A major motivating factor in establishing an object-oriented approach is to eliminate some of the errors encountered in the process. OOP treats data as critical to system development and does not allow it to flow freely around the system. It integrates the data more closely with the applications it uses and protects it from accidental conversion from external functions.

Object-oriented programs are the most recent concept among planning paradigms. It defines “object-oriented programs as a way to solve problems by creating a separate memory space for both data and functions that can be used as templates to build copies of such modules on demand.

Characteristics of OOP languages

1. Object: Things are organizations, which can exist individually. It has its own structures and mechanisms, in which structures define the appearance of objects and methods define their processes.

2. Category: It is a metaphor used to describe different objects of the same type.

3. Encapsulation: Data and methods, which work on data, are grouped and grouped, this object is known as encapsulation, and the group is known as object.

4. Abstraction: Means to hide the data of one item of a category from another object of the same category.

5. Inheritance: Invented property where an existing class can be used to build new classrooms, by acquiring all the structures and methods of the old class into a new class and adding new buildings / methods to the new class. The old category is known as the basic category or the main category. A new category is known as a made-up category or a sub-category.

6. Polymorphism: Polymorphism means "single display and multiple modes" i.e. a single interface can be used to provide different functionality.

Literature Reviews

Predictability of weather figures , predictability of weather with a numerical solution of statistics that control movement and climate change. Many climate forecasting techniques, in addition to being used for short-term weather forecasting, are being used in research studies such as air pollution and the effects of greenhouse gases on global climate change.

The first active weather forecasting model consisted of only one layer and could therefore show only temporary variations in the vertical structure of the atmosphere. Computers now allow the construction of multilevel models (usually about 10-20) that can solve vertical variations, temperature and humidity. These multi-mile species predict the basic climate fluctuations of large movement scales.

Identification Of Need

A detailed study of the process should be done with a variety of techniques such as interviews, questionnaires etc. Data collected by these sources must be evaluated in order to reach a conclusion. The conclusion is to understand how the system works. This program is called the existing system. The current system is now being processed and the problem location is identified.

The designer now acts as a problem solver and tries to solve the problems the business is facing. Solutions are offered as suggestions. The proposal is then weighed against an existing system by analysis and selection is best. The suggestion is presented to the user for user approval

Feasibility

A feasibility study to determine whether all relevant project considerations include economic, technical, legal, and strategic planning in order to find opportunities to successfully complete a project.

In the current system of learning, it is the task of finalizing the feasibility report. The outline of the possible study is as follows:

1) Statement for the purpose of problems.

2) Terms of reference.

3) Analysis of the existing system

Objective

The purpose of a project is a program in which software is installed, which means that the project is developed as a desktop application, and will work for a particular institution or organization. But over time the project can be changed to work online.

The purpose of developing a weather app is to download data needed to capture global data. Another purpose of building this software is to generate a report automatically at the end of the session or in the middle of the session or between sessions as needed.This project is basically a desktop application which means 3 content software works where it is installed under user control. global climate information. Another purpose of making this software is to generate a report automatically at the end of the session or in the middle of a session

System Analysis

System Analysis is a term used to describe the process of collecting and analyzing facts about the functioning of an existing environment so that an integrated operating system can be developed and used if it is found to be feasible.

System analysis can be considered as the most recent and perhaps the most complete method of solving computer problems. It helps to understand and compare the performance implications of a sub-program.

System analysis also involves the design of the system, which is a function that involves the creation of an integrated system based on facts revealed during the analysis.

System analysis is a process based on observation process, tasks and complex problems. So specifically

1. It provides a way to better understand complex structures.

2. It is a trading tool between the operating requirements of the sub-system and is compatible with the sub-system.

3. It helps to understand and compare the performance implications of a sub-program.

4. It helps to identify processes and mechanisms for building systems where sub-systems may have seemingly contradictory purposes.

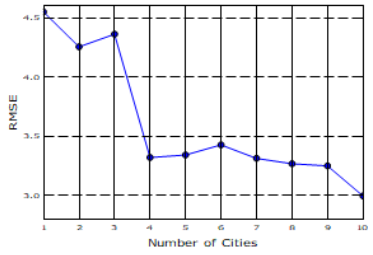
Lastly, it helps to put each plan under the expected plan and context so that the entire program achieves its goals with the resources available. It therefore builds synergy between plan and objectives.

Machine Learning Techniques

In this study, since the predicted results are continuous numerical values, the temperature in us, we use the regression method. We find that Random Forest Regression (RFR) is a superior regressor, as it incorporates many decision trees while making a decision. In addition, we suggest comparing several other state-of-the-art ML strategies with the RFR process. Restoration strategies included Ridge Regression (Ridge), Support Vector (SVR), Multi-layer Perceptron (MLPR), and Extra-Tree Regression (ETR).

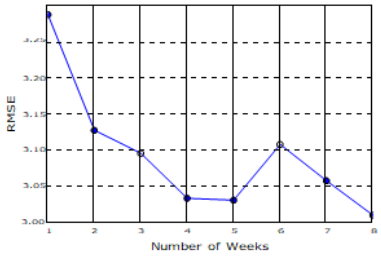
Dataset from Weather Station

We collected data on the actual weather of Nashville city from wunderground.com, as well as nine other cities around Nashville: Knoxville, Chattanooga, Jackson, Bowling Green, Paducah, Birmingham, Atlanta, Florence, and Tupelo. By finding location and date, the wunderground API returns a list of weather view data.



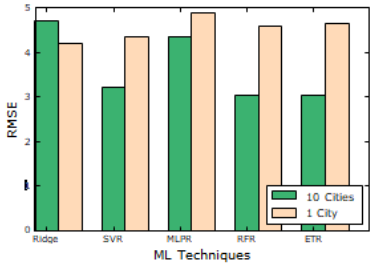
(a)

(a) RMSE on test set while considering neighboring cities



(b)

(b) RMSE on test set with increasing training size



(c)

(c) RMSE on test set for different ML models

Data Preprocessing

After receiving raw data from 'underground', we make sure that each line (record) in the database contains records of all ten cities for a period of time. We eliminate any feature with empty or invalid data while creating a database. Also, we convert separate elements in the database, such as wind direction and position, into dummy / indicator variables using a process called 'One Hot Encoding'.

We underwent this modification prior to the division of training and evaluation data. This is because, in both training and testing data, we need the same amount of feature variability. If we make this adjustment after a split, then there is no guarantee that both will have all the values of the categories of adjustable features.

If the number of training phase values and test sets are not the same, the conversion reflects the number of different features of these sets. That's why we need to make this transition before the division of training and database testing.

In addition, we do measure $x \leftarrow \frac{x-\mu}{\sigma}$ mean to all used as a training set, that week is the previous week of continuous variables so that the variables have almost zero meaning, which works, reducing computer costs while training models.

RESULTS

In this section, we present a complete overview of our trained models and weather channel data. The first set of results demonstrates the accuracy of the prediction while increasing the training data by adding neighboring cities, and by adding more weeks.

The second set of results strongly emphasizes the visual improvement of our models when neighboring cities are included in the training data.

Performance Measure

In all our experiments, we use the root mean squared error (RMSE) to evaluate our models. The calculation of RMSE is pretty straightforward shown in Equation 1.

$$RMSE = \sqrt{\frac{\sum_{t=1}^{n} (\hat{y}_t - y_t)^2}{n}} \qquad (1)$$

Where n is the number of test examples. yˆt and yt are predicted temperature and actual temperature, respectively.

Data related to weather

In order to use the classification data for equipment division, you must convert text labels to another form. There are two types of encoding. First label, each text label value is replaced by a number. The second is to enter one code “hot”, each text label value becomes a column with a binary value (1 or 0). Most machine learning platforms have functions that enable coding itself.

As a rule, hot one-line encoding is appealing, since labeling numbers can sometimes confuse the machine learning algorithm, making you think that the codes were ordered.

Besides, when calculating Euclidean distances, high-value numbers can begin to “dominate” unreasonably, and even the slightest decline may not coincide.

The evaluation results show that these machine learning models can predict weather features accurately enough to compete with traditional models.

Conclusion

With this system predicting the report become easier. Less chances of malfunctioning exist. The plan has reached a stable stage but further progress is yet to be made.

The system operates at a high level of efficiency and every user associated with the system understands its benefits. It was designed to solve as a requirement .

In the future this system can be used all over the world and will be designed in the area of the cross.

It is easy to use , so that every user can easily handle it. This application is upgraded in such a way that it will not consume much RAM and phone memory.

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